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Consumer and Corporate Affairs Canada
Patent Office

(21) (A1) 2,088,899
(22) 1993/02/05
(43) 1994/08/06

5,083,2/26

(51) INTL.CL.[5] A63B-059/14

(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Replacement Blade for a Hockey Stick and Method for Manufacturing Same

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(57) 28 Claims

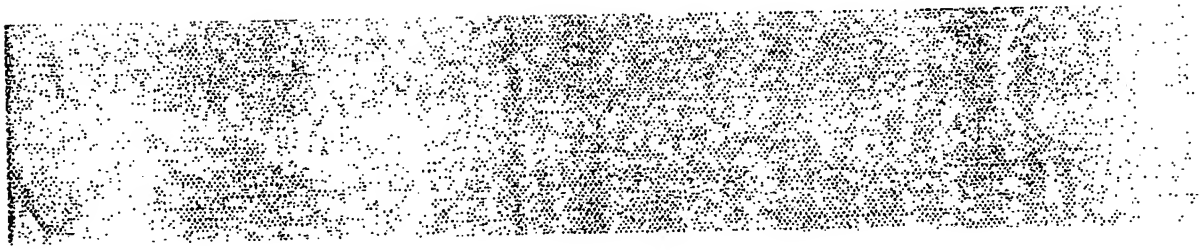
Notice: This application is as filed and may therefore contain an incomplete specification.

Canada

CCA 3254 (10-92) 41 7530-21-936-3254

ABSTRACT OF THE DISCLOSURE

A replacement blade for a hockey stick comprising a puck-engaging member and a projecting shank for mounting the puck-engaging member to a hockey stick handle. The shank comprises a core to which are bonded layers of synthetic fibers. Layers of hardwood are affixed to the layers of synthetic fibers through the intermediary of veneers saturated with bonding medium.



FIELD OF THE INVENTION

The present invention relates to the art of manufacturing hockey sticks and, more particularly, to a replacement blade for a hockey stick and to methods for manufacturing same. The invention also extends to a novel replacement blade blank permitting to manufacture simultaneously a pair of individual replacement blades.

BACKGROUND OF THE INVENTION

Traditionally, hockey sticks have been manufactured entirely from hardwood selected to provide the desired combination of strength, rigidity and optimal weight. Due to the increasing rarity of suitable raw material, manufacturers have turned to modern material science to seek practical alternatives. In this regard, glass-fibers/softwood composites have shown good potential, allowing to manufacture highly performant hockey sticks at reasonable cost.

Hockey sticks made of composite materials are usually manufactured as structurally integral units by permanently affixing the blade to the handle and then wrapping the assembly with a reinforcing layer of synthetic fibrous material stabilized in synthetic resin. A disadvantage of this mode of construction resides in that if one component

of the hockey stick fails, the entire unit is rendered useless and must be discarded. More specifically, breakage of a hockey stick would typically occur in the region of the blade which is subjected to high stresses when the player violently strikes the puck. Accordingly, if the blade of the hockey stick is damaged beyond repair, the handle is rendered useless even though it remains a functional component.

To alleviate this drawback, some manufacturers have recently developed modular hockey sticks featuring replaceable blades. The ultimate user of the product would typically purchase a high quality, long lasting handle, made from extruded aluminum for example, to which is mounted a removable blade. The latter comprises a blade portion from which projects a relatively short shank terminating at its upper end by a section having a reduced thickness which is designed to slidingly engage a socket on the lower extremity of the handle. A secure joint is made between the handle and the blade by a suitable adhesive.

Although modular hockey sticks present significant advantages, it has been observed that the removable blade has a tendency to fail prematurely at relatively low stress levels. A possible explanation of this phenomenon is the creation of a weakness zone on the replacement

blade at the area of union between the reduced thickness zone of the shank and the lower portion of the shank. Under high stress conditions, cracks may form at this weakness zone, causing a major delamination which propagates along the interface of the glass fibers layer and the wooden layer.

OBJECTS AND STATEMENT OF THE INVENTION

An object of the present invention is a novel hockey stick construction suitable for manufacturing individual replacement blades or hockey sticks in which the blade is permanently united to the handle, permitting to achieve a strong bond between a synthetic fibrous layer and a layer of wooden material, which is highly resistant to delamination.

Another object of the invention is a method for manufacturing the aforementioned hockey stick and replacement blade.

A further object of the invention is a novel method for producing simultaneously a pair of replacement blades.

Yet, another object of the invention is a novel replacement blade blank used for manufacturing simultaneously a pair of replacement blades.

As embodied and broadly described herein, the invention provides a replacement blade for a hockey stick, comprising:

- a puck engaging member:

- a shank projecting from the puck engaging member for engaging a hockey stick handle, the shank including:

a) a core having a pair of opposite lateral surfaces;

b) a laminated reinforcing element mounted to each lateral surface of the core to impart strength and rigidity to said core, the laminated reinforcing element including:

i) a layer of synthetic fibers bonded in a face-to-face relationship to a respective lateral surface of the core;

ii) a veneer fully saturated with bonding medium adhered to the layer of synthetic fibers;

iii) a layer of wooden material substantially thicker than the veneer and adhered thereto, said veneer extending at an interface between the layers and constituting means for increasing bond strength therebetween.

By interposing a thin veneer impregnated with bonding medium, such as a synthetic resin or any other suitable substance between the synthetic fibers layer and the layer of wood, a considerably stronger layer-to-layer bond is achieved by comparison to a composite structure in which the synthetic fibers layer is directly united to the thick wood layer.

This form of construction is applicable equally well to hockey sticks in which the blade is permanently affixed to the handle as well as to the manufacture of replacement blades. In the latter case, the increased bond strength between the synthetic fibrous layer and the thick wood layer significantly reduces the risks of delamination of the blade when the latter is subjected to intense mechanical stresses.

In a most preferred embodiment, the shank of the blade comprises an elongated core of soft wood material of rectangular cross-sectional shape having a pair of main opposite surfaces. Each stratified reinforcing element, affixed to a respective main surface of the core, includes a first layer of glass fibers oriented along the longitudinal axis of the core and which is directly bonded thereto. A veneer impregnated with synthetic resin is mounted to the layer of glass fibers. A pair of identical, thick, hardwood layers, having individual

thicknesses significantly exceeding the thickness of the veneer are superposed thereto in order to complete the assembly.

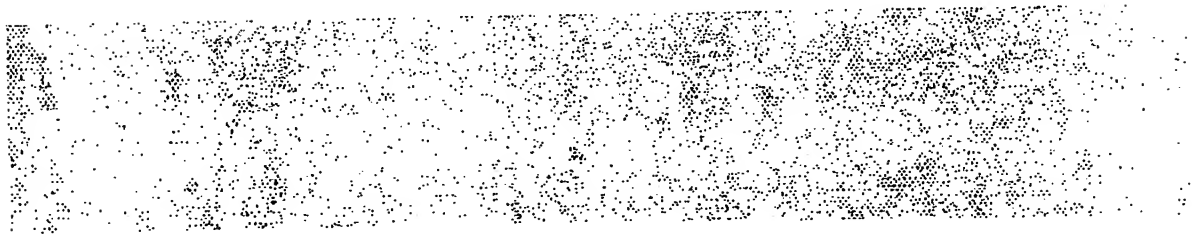
The outer surface of the shank constituted by the dual layer of hardwood material is machined to form on the shank an upper region of reduced thickness closely conforming to the blade receiving socket at the lower end of the handle. This operation involves the removal of significant amounts of wood material which leaves a shoulder forming an area of union between the reduced thickness zone and the remaining portion of the shank.

As embodied and broadly described herein, the invention also provides a hockey stick, comprising:

- a puck engaging member;
- a shank projecting from the puck engaging member, the shank including:

a) a core having a pair of opposite lateral surfaces;

b) a laminated reinforcing element mounted to each lateral surface of the core to impart strength and rigidity to the core, said laminated reinforcing element including:



i) a layer of synthetic fibers bonded in a face-to-face relationship to a respective lateral surface of the core;

ii) a veneer fully saturated with bonding medium and adhered to the layer of synthetic fibers;

iii) a layer of wooden material substantially thicker than the veneer and adhered thereto, the veneer extending at an interface between the layers and constituting means for increasing bond strength therebetween.

As embodied and broadly described herein the invention further provides a method for manufacturing a replacement blade comprising a puck engaging member and a projecting shank for connecting the puck engaging member to a handle of a hockey stick, the method comprising the steps of:

- providing a core of wooden material having a pair of opposite lateral surfaces;

- depositing against each lateral surface of the core a layer of synthetic fibers;

- depositing against each layer of synthetic fibers a veneer;

- depositing against each veneer a layer of wooden material substantially thicker than the veneer;

- saturating the veneers with uncured bonding medium;

- bonding the layers of synthetic fibers to the core and curing the bonding medium to intimately unite the layers of wooden material to a respective layer of synthetic fibers through the intermediary of the veneers, thereby forming a laminated structurally integral assembly;

- forming a puck engaging member at an extremity of the laminated structurally integral assembly.

In a preferred embodiment, the various layers constituting the shank are deposited in a superposed relationship in a mould having a suitable shape and uncured resin is applied between the various layers of the assembly, particularly to the veneers to fully saturate the thin wood sheets. The mould is then closed to create a mechanical pressure on the laminated structure and the temperature in the mould is elevated to cure the resin. A puck engaging member, manufactured according to traditional techniques is then attached to the shank. Finally, the upper extremity of the shank is machined to form the section of reduced thickness provided for engaging the socket at the lower end of the handle of the hockey stick.

Most preferably, a wide laminated board, having the same stratification as the shank is formed in a mould as described above. The board is cut longitudinally into a plurality of long shaft-like members. Puck engaging members are affixed at opposite extremities of each shaft-like member to form a pair of siamese replacement blades. Each shaft-like member is then cut transversally and the resulting individual replacement blades are subjected to the appropriate finishing operations.

As embodied and broadly described herein, the invention provides a blank of a replacement blade for a hockey stick, comprising:

- a pair of puck engaging members in a spaced apart relationship;

- a shaft-like member interconnecting the puck engaging member.

BRIEF DESCRIPTION OF THE DRAWINGS

- Figure 1 is a perspective view of a hockey stick having a modular construction having a handle to which is removably mounted a replaceable blade;

- Figure 2 is a fragmentary, perspective view of the joint between the handle and the replaceable blade of the hockey stick;

- Figure 3 is a cross-sectional view along lines 3-3 in Figure 1;

- Figure 4 is an exploded view of a laminated board for manufacturing simultaneously shanks for replacement blades in accordance with the invention;

- Figure 5 illustrates the laminated board of Figure 4 in a fully assembled condition; and

- Figure 6 is a perspective view of a blank for simultaneously manufacturing a pair of replacement blades.

DESCRIPTION OF A PREFERRED EMBODIMENT

With reference to the annexed drawings, Figure 1 illustrates a hockey stick of modular construction designated comprehensively by the reference numeral 10, comprising a handle 12 to which is releasably mounted a replacement blade 14. The latter can be separated from the handle 12 permitting to reuse the handle 12 if the blade 14 is damaged.

The blade 14 comprises a paddle-shaped puck engaging member 16 from which projects upwardly a shank 18 having a generally rectangular cross-section closely conforming to the outer cross-sectional shape of the handle 12. The upper end of the shank 18 has a section 20 of reduced thickness forming a tongue 22 closely conforming to a socket 24 provided on the lower end of the handle 12. A peripherally extending shoulder 26 having a height corresponding generally to the wall thickness of the handle 12 extends at the area of union between the tongue 22 and the lower portion of the shank 18. The shoulder 26 constitutes an abutment which is engaged by the lower extremity of the handle 12 when the tongue 22 is slidingly inserted in the socket 24. To prevent undesirable removal of the blade 14 from the handle 12, the tongue 22 is coated with a suitable adhesive. Adhesives of the hot-melt type have been found advantageous allowing to release the bond by the application of heat when replacement of the blade 14 is required.

With reference to Figure 3, the shank 18 has a laminated construction comprising a central core 26 made of soft wood material of rectangular cross-sectional shape. As a result of this configuration, the core 26 has a pair of primary opposite lateral surfaces 28 and 30 and a pair of opposed smaller surfaces 32 and 34. On the lateral surfaces 28 and 30 of the core 26 are bonded

stratified reinforcing element 36 and 38, respectively. Each reinforcing element comprises a layer of unidirectional glass fibers 40, i.e. a layer in which the glass fibers are parallel to one another and extend along the longitudinal axis of the shank 18. As it is customary in the art, the glass fibers of the layer 40 are embedded in a mass of synthetic resin. On top of the layer 40 is mounted a veneer 42 constituted by a thin sheet of hardwood material which typically has a thickness of less than 1 millimeter.

A critical aspect of the invention resides in that the veneer forming the layer 42 is fully saturated with bonding medium capable of strongly adhering to the synthetic fibrous layer 40. Such bonding medium may be synthetic resin which, when cured, intimately associates the layers 40 and 42. Since the layer 42 is very thin, the impregnation process can be achieved relatively easily, for example, by soaking the veneer in a bath of uncured resin or simply by depositing during the assembly of the shank 18 sufficient quantities of uncured resin on both sides of the layer 42.

On top of the layer 42 are mounted two identical layers of hardwood material 44 and 46, respectively. The bonding of the layers 44 and 46 to one another, as well as the bonding of layer 44 to the layer 42 is achieved by the

same synthetic resin used for uniting the layers 40 to 42. Each of the layers 44 and 46 is significantly thicker than the veneer forming layer 42, typically in the order of two millimeters.

To complete the assembly of the shank 18, a woven cloth of glass fibers 48 coated with synthetic resin, is laid on the wood layers 46. The resin in the cloth is then cured according to known techniques. The application of an outer wrap of woven glass fibers cloth is common in the art of manufacturing hockey sticks and it is used primarily to further reinforce the stick by forming on its outer surface a hard, wear-resistant shell.

The method for manufacturing the replacement blade 14 will now be described in connection with Figures 4, 5 and 6.

Broadly stated, the method consists of manufacturing first a laminated board which is then cut longitudinally to form a pair of siamesed shanks. Puck engaging members are formed on each shank and the resultant assembly is cut to form a pair of individual replacement blades.

An exploded view of the laminated board, designated comprehensively by the reference numeral 50 is shown in Figure 4. It will be apparent that the arrangement of the

various layers is identical to the disposition of the various layers in the shank 18 except that the synthetic fibers layers 40 are discontinuous and are present only in the end regions of the laminated board 50.

The width of the various layers forming the laminated board 50 is several times the transverse dimension of the shank 18, allowing to manufacture simultaneously a plurality of shanks from a single board 50.

To manufacture the board 50, the various layers are deposited in a superposed relationship in the proper order and coated with the suitable synthetic resin. The assembly is then laid in a heated shaping mold which presses the layers together under high temperature conditions to cure the assembly and form a structurally integral unit. The resulting board 50 is shown in Figure 5.

The next operation consists of cutting longitudinally the laminated board 50 to form a plurality of elongated, shaft-like members 52. Each member 52 is constituted by a pair of siamesed shanks 18 united to one another by a central region 54 which is free of the layers 40 constituted by synthetic fibers.

Subsequently, the individual shaft-like members 52 are machined to form at their extremities central, longitudinally extending slits (not shown in the drawings) in which are inserted boards 54 to form the puck engaging members 16. Reinforcement blocks 56 are also applied and the resultant assembly is finished according to known processes to form a pair of replacement blades united by their shank portions. The member 52 is then transversely cut at two longitudinally spaced apart locations, each one corresponding to a juncture between the central region 54 and the end regions containing a reinforcing glass fiber layers. The manufacturing process is completed by machining the upper extremities of the shanks 18 to form the tongues 22.

The remaining central segment 54 is then cut in half and can be used for making the reinforcement blocks 56 when manufacturing another pair of replacement blades.

The method of manufacture of replacement blades in accordance with the invention has been found particularly advantageous by allowing to produce two replacement blades at the same time. Since the blades remain united to one another in a single assembly during substantially the entire manufacturing process, the manipulation of the blades is made much simpler and waste is reduced, thereby

rendering the entire process less time consuming and more cost effective.

The above description of the present invention should not be interpreted in any limiting manner since refinements and variations are possible without departing from the spirit of the invention. The scope of the invention is defined in the appended claims and their equivalents.

1. Replacement blade for a hockey stick, comprising:

- a puck engaging member:

- a shank projecting from said puck engaging member for engaging a hockey stick handle, said shank including:

a) a core having a pair of opposite lateral surfaces;

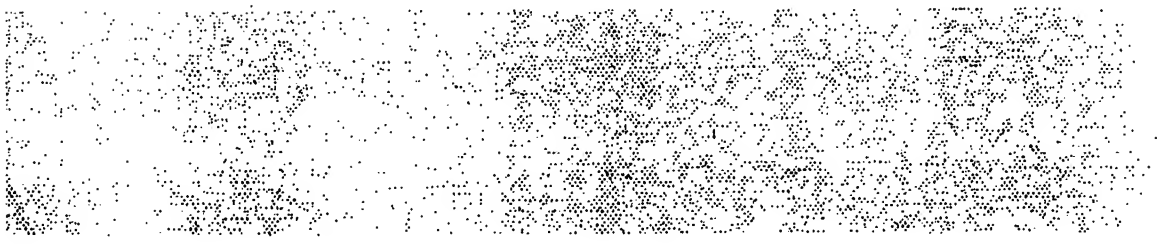
b) a laminated reinforcing element mounted to each lateral surface of said core to impart strength and rigidity to said core, said laminated reinforcing element including:

i) a layer of synthetic fibers bonded in a face-to-face relationship to a respective lateral surface of said core;

ii) a veneer fully saturated with bonding medium adhered to said layer of synthetic fibers;

iii) a layer of wooden material substantially thicker than said veneer and adhered thereto, said veneer extending at an interface between said layers and constituting means for increasing bond strength therebetween.

2. Replacement blade as defined in claim 1, wherein said shank includes at an upper end thereof a section of decreased thickness for engaging a conforming socket on a hockey stick handle.



3. Replacement blade as defined in claim 2, wherein said shank includes a shoulder defining an area of union between said section of decreased thickness and a remaining portion of said shank.

4. Replacement blade as defined in claim 1, wherein said laminated reinforcing element comprises an inner and outer layers of wooden material which are in a superposed relationship, said inner and outer layers being affixed to said veneer.

5. Replacement blade as defined in claim 1, wherein said layer of synthetic fibers comprises fibers extending along a longitudinal axis of said shank.

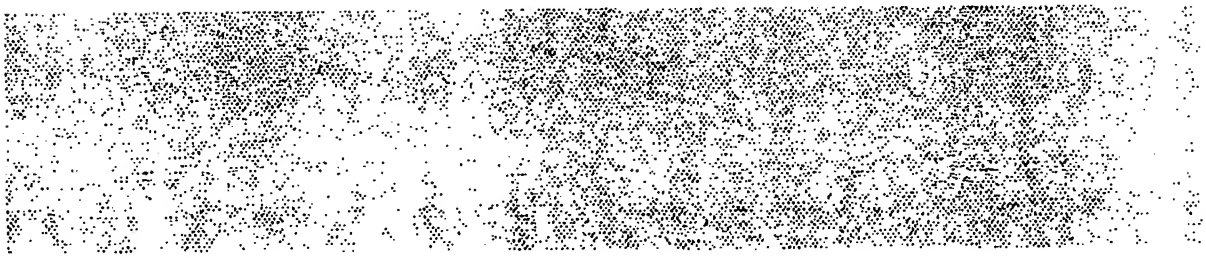
6. Replacement blade as defined in claim 1, wherein said core is made of relatively soft wooden material.

7. Replacement blade as defined in claim 1, wherein said layer of wooden material is made of hardwood.

8. Replacement blade as defined in claim 1, wherein said layer of synthetic fibers comprises glass fibers.

9. A hockey stick, comprising:

- a puck engaging member;
- a shank projecting from said puck engaging member, said shank including:



a) a core having a pair of opposite lateral surfaces;

b) a laminated reinforcing element mounted to each lateral surface of said core to impart strength and rigidity to said core, said laminated reinforcing element including:

i) a layer of synthetic fibers bonded in a face-to-face relationship to a respective lateral surface of said core;

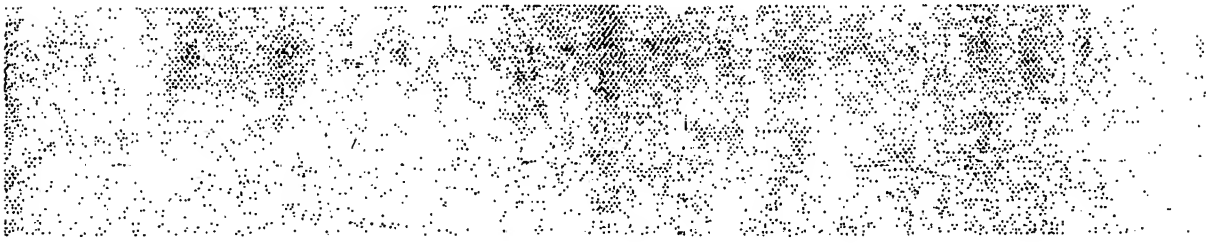
ii) a veneer fully saturated with bonding medium and adhered to said layer of synthetic fibers;

iii) a layer of wooden material substantially thicker than said veneer and adhered thereto, said veneer extending at an interface between said layers and constituting means for increasing bond strength therebetween.

10. A hockey stick as defined in claim 9, wherein said laminated reinforcing element comprises an inner and outer layers of wooden material in a superposed relationship, said inner and outer layers being adhered to said veneer.

11. A hockey stick as defined in claim 9, wherein said layer of synthetic fibers comprises fibers extending along a longitudinal axis of said shank.

12. A hockey stick as defined in claim 9, wherein said core is made of relatively soft wooden material.



13. A hockey stick as defined in claim 9, wherein said layer of wooden material is made of hardwood.

14. A hockey stick as defined in claim 9, wherein said layer of synthetic fibers comprises glass fibers.

15. A method for manufacturing a replacement blade comprising a puck engaging member and a projecting shank for connecting said puck engaging member to a handle of a hockey stick, said method comprising the steps of:

- providing a core of wooden material having a pair of opposite lateral surfaces;

- depositing against each lateral surface of said core a layer of synthetic fibers;

- depositing against each layer of synthetic fibers a veneer;

- depositing against each veneer a layer of wooden material substantially thicker than said veneer;

- saturating said veneers with uncured bonding medium;

- bonding said layers of synthetic fibers to said core and curing said bonding medium to intimately unite each layer of wooden material to a respective layer of synthetic fibers through the intermediary of said veneers, thereby forming a laminated structurally integral assembly;

- forming a puck engaging member at an extremity of said laminated structurally integral assembly.

16. A method as defined in claim 15, further comprising the step of bonding to each veneer an inner and outer layers of wooden material in a superposed relationship.

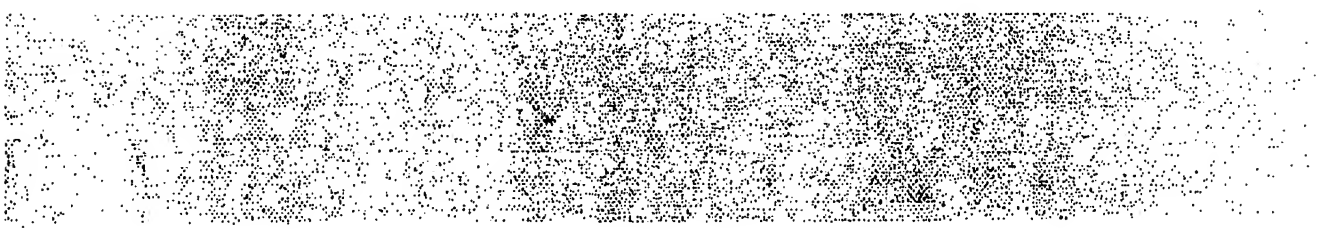
17. A method as defined in claim 15, comprising the step of applying uncured bonding substance between said core and said layers of synthetic fibrous material and curing said bonding substance to intimately unite said layers of synthetic fibrous material to said core.

18. A method as defined in claim 15, comprising the step of compressing said core, said layers and said veneers together and elevating a temperature for curing said binder medium.

19. A method as defined in claim 15, comprising the step of providing on an extremity of said laminated structurally integral assembly a section of reduced thickness for engaging a handle of a hockey stick.

20. A method for manufacturing a replacement blade for a hockey stick, said replacement blade comprising a puck engaging member and a shank projecting therefrom for engaging a handle of a hockey stick, said method comprising the steps of:

- forming an elongated shaft-like member;
- affixing at each end of said shaft-like member a puck engaging member; and



- cutting said shaft-like member transversally to form a pair of individual replacement blade components.

21. A method as defined in claim 20, wherein said shaft-like member has a laminated structure.

22. A method as defined in claim 21, wherein said shaft-like member comprises:

- a core of wooden material

- a layer of synthetic fibers bonded to said core for imparting strength and rigidity to said core.

23. A method as defined in claim 20, further comprising the steps of:

- forming a board having a width which exceeds substantially a width of said shaft-like member; and

- cutting said board longitudinally to form a plurality of shaft-like members therefrom.

24. A method as defined in claim 23, comprising the step of forming said board with a laminated structure.

25. A method as defined in claim 20, comprising the step of forming on an upper extremity of said shank component a section of reduced thickness for engaging a socket on a hockey stick handle.

26. A blank of a replacement blade for a hockey stick, comprising:

- a pair of puck engaging members in a spaced apart relationship;

- a shaft-like member interconnecting said puck engaging members.

27. A blank as defined in claim 26, wherein said shaft-like member has a laminated structure.

28. A blank as defined in claim 26, wherein said shaft-like member comprises a reinforcing layer of synthetic fibers.

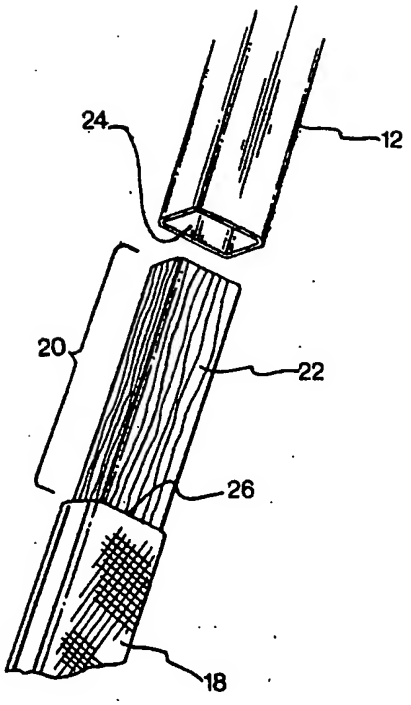


FIG.2

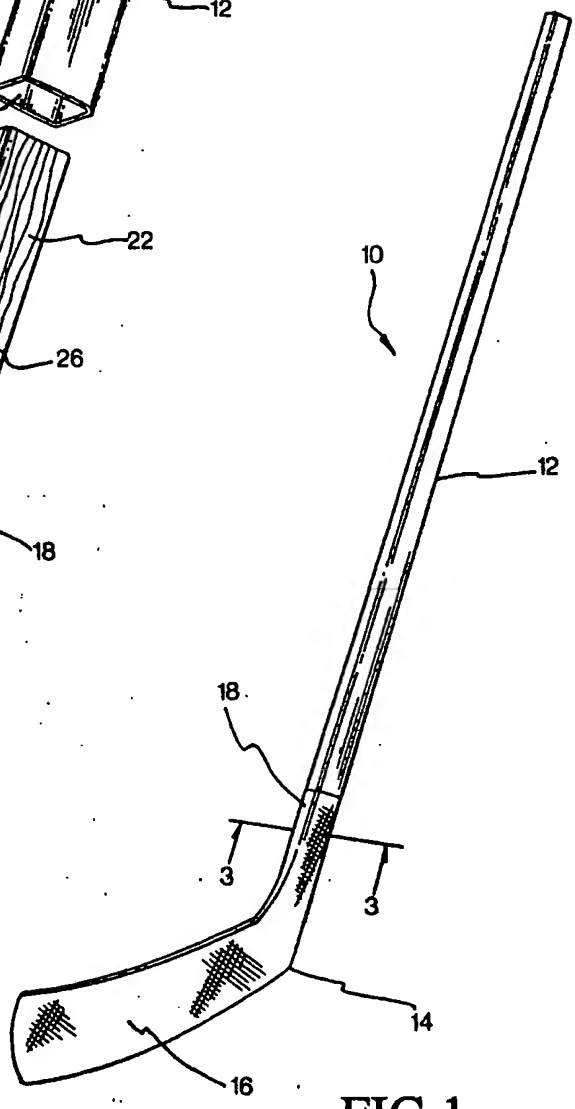


FIG.1

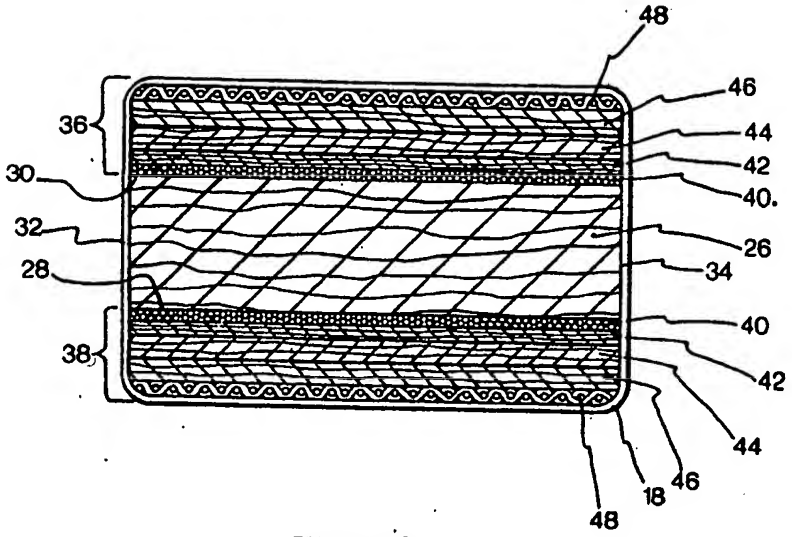


FIG.3

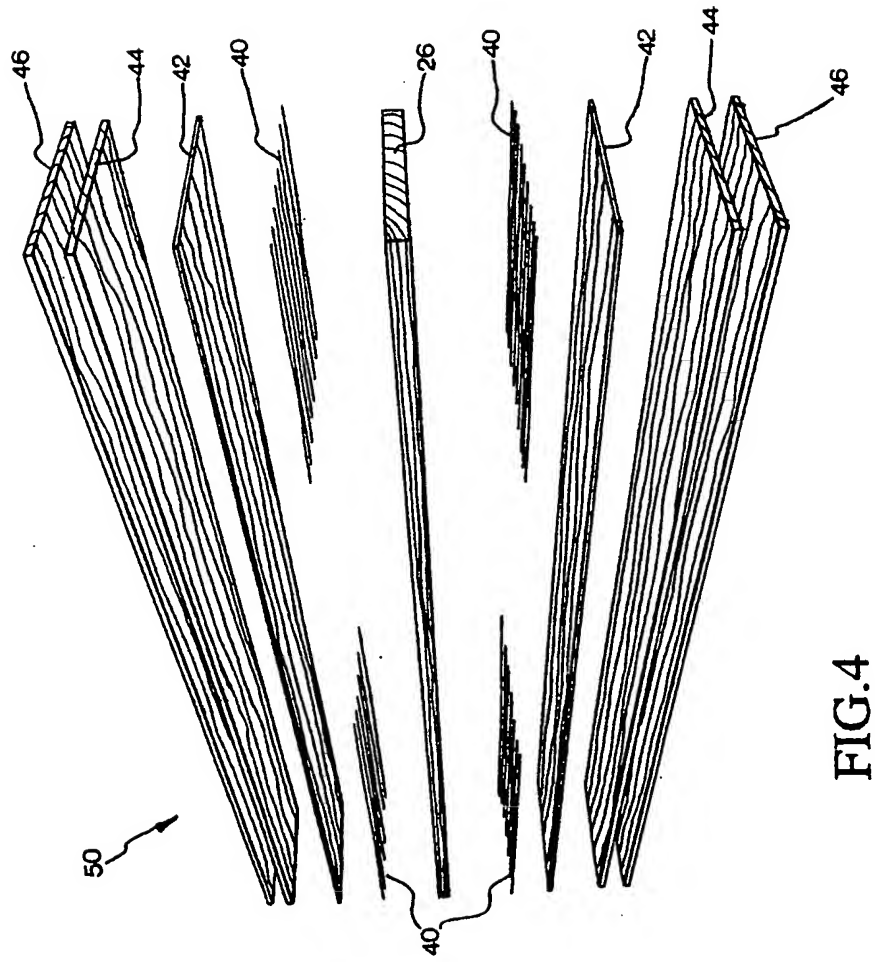


FIG.4

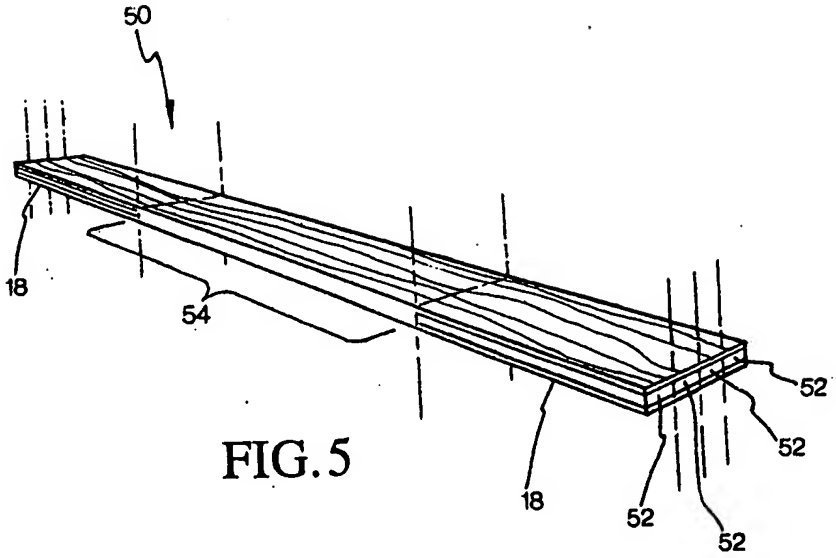


FIG.5

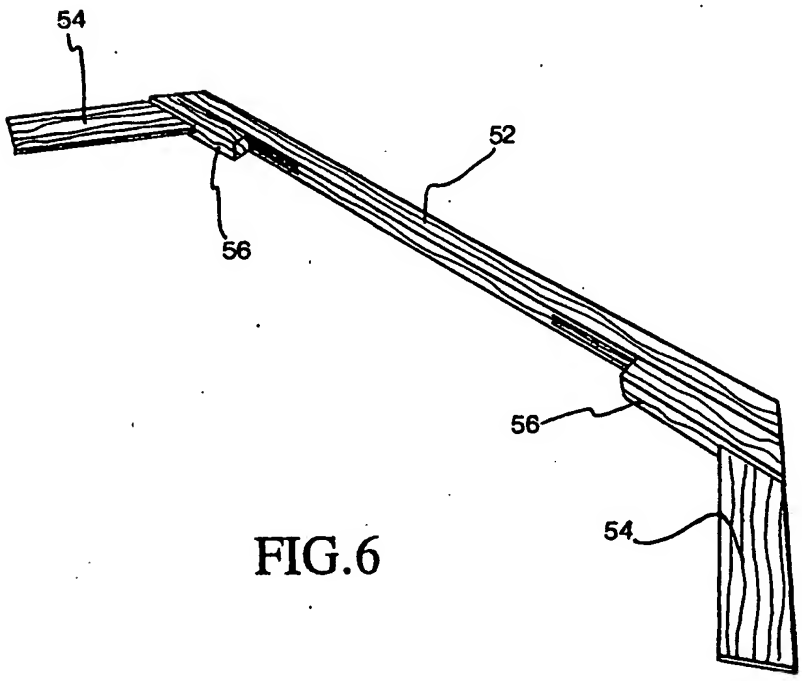


FIG.6